Amendments to the Drawings

The attached sheet of drawings includes changes to Fig. 6. This sheet, which includes Fig. 6, replace the original sheet including Fig. 6. In Fig. 6, the reference numeral 51 has been added.

Attachment: Replacement Sheets

REMARKS/ARGUMENTS

The Examiner is thanked for the Office Action mailed November 1, 2007. The status of the application is as follows:

- Claims 1-20 are pending. Claims 13, 14, 16 and 20 have been amended.
- The drawings are objected to as failing to comply with 37 CFR §1.84(p)(5).
- The specification is objected to for informalities.
- Claim 16 is objected to for informalities.
- Claims 13-14 are rejected under 35 U.S.C. §112, second paragraph.
- Claim 6 is rejected under 35 U.S.C. 102(b) as being anticipated by Turbell et al. ("An improved PI-method for reconstruction for helical cone-beam projections," 24-30 October 1999, Nuclear Science Symposium, 1999, IEEE, pages 865-868).
- Claims 6-11 and 15-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Katsevich (US 6,574,299).
- Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich and Zeng et al. (US 5,559,335).
- Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Danielsson et al. (DE 199 44 701 A1) in view of Katsevich and Zeng et al.
- Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich and Zeng et al. and further in view of Hsieh (US 6,529,575).
- Claims 7-11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich.
- Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich and further in view Zeng et al.

The objections and rejections are discussed below.

The Objection to the Drawings

The drawings are objected to as failing to comply with 37 CFR §1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: K planes 51. This

rejection should be withdrawn because Fig. 6 has been amended herein to include reference numeral 51.

The Objection to Specification

The specification is objected to for informalities. In particular, the Office notes typographical errors on page 6, equation 3, and page 7, line 9. This objection should be withdrawn as the specification has been amended herein to cure the subject typographical errors.

The Objection to Claim 16

Claim 16 is objected to for a typographical error; namely, claim 16 currently depends from itself. This objection should be withdrawn as claim 16 has been amended herein to depend from claim 15.

The Rejection of Claims 13 and 14 under 35 U.S.C. 112, Second Paragraph

Claims 13 and 14 stand rejected under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In particular, the Office notes that some of the variables in the Equations in claims 13 and 14 are not defined. This rejection should be withdrawn as claims 13 and 14 have been amended herein to define the variables in the equations recited therein.

As this is the only rejection of claim 13 in this Office Action, allowance of claim 13 is respectfully requested.

The Rejection of Claim 6 under 35 U.S.C. 102(b)

Claim 6 is rejected under 35 U.S.C. 102(b) as being anticipated by Turbell et al. This rejection should be withdrawn because Turbell et al. does not teach each and every element as set forth in the subject claims and, therefore, does not anticipate claim 6.

> A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). MPEP §2131.

Independent **claim 6** is directed towards a method that includes producing measuring values indicative of radiation that traverses an examination zone and is detected by a radiation sensitive detector and ***reconstructing the measuring values as a function of corresponding projection angles*** to generate an image indicative of the examination zone. The Office asserts that Turbell et al. teaches reconstructing the measuring values as a function of corresponding projection angles to generate an image indicative of the examination zone in step 4 of the introduction and Figures 6-8. However, the referenced sections of Turbell et al. do not teach or suggest such claim. Rather, step 4 states "[b]ackprojection of each filtered projection value along the corresponding ray with constant magnification factor = 1" and Figures 6-8 shows images of reconstructed slices with a grayscale interval of 100 HU. Neither step 4 nor Figures 6-8 teach or suggest reconstructing measuring values as a function of corresponding projection angles to generate an image indicative of the examination zone as recited in claim 6. Accordingly, this rejection should be withdrawn.

The Rejection of Claims 6-11 and 15-20 under 35 U.S.C. 102(e)

Claims 6-11 and 15-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Katsevich. This rejection should be withdrawn because Katsevich does not teach each and every element as set forth in the subject claims and, therefore, does not anticipate claims 6-11 and 15-20.

Independent **claim 6** requires producing measuring values indicative of radiation that traverses an examination zone and is detected by a radiation sensitive detector and ***reconstructing the measuring values as a function of corresponding projection angles*** to generate an image indicative of the examination zone. The Office asserts that Katsevich teaches reconstructing the measuring values as a function of corresponding projection angles to generate an image indicative of the examination zone at column 1, lines 5-9. However, the referenced sections of Katsevich do not teach or suggest such claim aspects. Rather, column 1, lines 5-9, of Katsevich states that "[t]his invention relates to computer tomography, and in particular to processes and systems for reconstructing three dimensional images from the data obtained by a spiral scan, and this invention claims the benefit of priority to …." The reference section of

Katsevich is silent regarding reconstructing measuring values as a function of corresponding projection angles to generate an image indicative of the examination zone as recited in claim 6. As such, this rejection should be withdrawn.

Independent **claim 15** is directed towards a method that includes identifying a first voxel from a plurality of voxels within an examination zone to reconstruct and ***reconstructing the first voxel as a function of a first set of corresponding projection angles indicative of angles at which a radiation beam traverses the first voxel.*** The Office asserts that Katsevich teaches the emphasized claim aspects in step 50 and Figure 2. However, the referenced sections of Katsevich do not teach or suggest reconstructing the first voxel as a function of a first set of corresponding projection angles indicative of angles at which a radiation beam traverses the first voxel. Figure 2 discloses that in the step 50, the image of the object being computed is updated by performing back projection. Figure 11 shows a flow chart for the backprojection that corresponds to step 50 of Figure 2. The flow chart includes steps 51-58.

From the flow chart of Figure 11, at step 51, a reconstruction point x is fixed. Step 52 determines whether the filtered data affects the image at x. If so, then the filtered data is used for image reconstruction at x. If not, then another point should is selected. In step 53, the projection of x onto the detector plane and the unit vector, which points towards x is found. In step 54, lines from a family of lines and points on the lines that are close to the projection x are identified. In step 55, interpolation is used to estimate values from the results of values obtained in step 54. In step 56, the contribution from the filtered data to the image being reconstructed at the point x is computed. In step 57, the contribution to the image being reconstructed at the point x is added according to a pre-selected scheme. In step 58, flow loops around to step 51 and a next reconstruction point x is fixed.

In view of the above, it is readily apparent that the referenced sections of Katsevich do not teach or suggest reconstructing the first voxel as a function of a first set of corresponding projection angles indicative of angles at which a radiation beam traverses the first voxel. Therefore, this rejection of claim 15 should be withdrawn.

Independent **claim 17** requires a detector that detects radiation from a conical radiation beam traversing an examination zone and that generates measuring values indicative of the detected radiation and ***a reconstructor that integrates the measuring values over projection***

angles corresponding to angles enclosed by a PI line of an object point projected in a plane perpendicular to an axis of rotation. The Office asserts that Katsevich teaches the emphasized claim aspects at column 5, lines 36-44, Figure 4, and Equation 1. However, the referenced sections of Katsevich do not teach or suggest a reconstructor that integrates the measuring values over projection angles corresponding to angles enclosed by a PI line of an object point projected in a plane perpendicular to an axis of rotation. Rather, column 5, lines 36-44, and Figure 4 are used to define a PI segment as the segment of line endpoints, which are located on a spiral path, separated by less than one pitch in the axial direction, and that include a reconstruction point x. Equation 1 describes the spiral path. In view of the foregoing, the referenced sections of Katsevich do not teach or suggest a reconstructor that integrates the measuring values over projection angles corresponding to angles enclosed by a PI line of an object point projected in a plane perpendicular to an axis of rotation. Thus, this rejection of claim 17 should be withdrawn.

Claims 7-11, 16 and 18-19 directly or indirectly depend from independent claims 6, 15 and 17 and are allowable at least by virtue of their dependencies

Claim 20 has been amended herein at least to depend from claim 1. As such, this rejection is moot.

The Rejection of Claims 1-3 under 35 U.S.C. 103(a)

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich and Zeng et al. This rejection should be withdrawn because the combination of Turbell et al., Katsevich and Zeng et al. does not teach or suggest all the limitations of claims 1-3 and, therefore, does not establish a *prima facie* case of obvious with respect to claims 1-3.

> To establish a *prima facie* case of obviousness, ... the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP §2143.

Independent **claim 1** is directed towards a computed tomography method, which includes, *inter alia*, determining the partial derivative of measuring values, multiplying the integrated partial derivative of the measuring values by a second weighting factor which

corresponds to the reciprocal value of the cosine of a fan angle of the beam associated with the measuring values. The combination of Turbell et al., Katsevich and Zeng et al. does not teach or suggest these claim aspects.

The Office concedes that Turbell et al. fails to teach or suggest determining the partial derivative of measuring values. In an attempt to make up for this conceded deficiency, the Office asserts that Katsevich teaches this claim aspect and that it would have been obvious to one of ordinary skill in the relevant art to modify Turbell et al. with this teaching of Katsevich to produce exact images with reduced scanning times as taught by Katsevich in column 2, lines 24-46. Applicant traverses this assertion as the referenced section of Katsevich does not disclsoes that the partial derivative has anything to do with reducing scanning times. At most, column 2, lines 24-46, states objects of the invention, which includes creating exact images with minimal computer power. Nowhere in the referenced section of Katsevich is a step of determining a partial derivative of measuring values connected to reducing scanning times as purported by the Office.

The Office also concedes that Turbell et al. fails to teach or suggest multiplying the integrated partial derivative of the measuring values by a second weighting factor which corresponds to the reciprocal value of the cosine of a fan angle of the beam associated with the measuring values. In an attempt to make up for this conceded deficiency, the Office asserts that Zeng et al. teaches this claim aspect at column 4, lines 45-46 and 52-56. However, this section of Zeng et al. does not teach or suggest the subject claim aspect. Instead, column 4, lines 45-46 and 52-56, discloses that when an image volume of diverging rays 36 is warped into a pseudo-parallel-beam volume, a weighting factor of $1/\cos(\theta)$ is introduced for each diverging ray 36, where θ is the angle between the original ray and the pseudo-parallel ray. Hence, θ is an angle between the original and pseudo-parallel rays, and not the fan angle of the beam. Thus, the referenced section of Zeng et al. does not teach or suggest the subject claim aspect.

Independent **claim 3** recites limitation similar to those of claim 1. As such, the above discussion regarding claim 1 applies *mutatis mutandis* to claim 3.

As noted *supra*, the dependency of **claim 20** has been changed, and claim 20 now depends from claim 1. Claim 20 has also been amended and now requires the multiplying step to include multiplying the integrated partial derivative of the measuring values by a third weighting

factor which corresponds to an inverse of a radius of the helix. The combination of Turbell et al., Katsevich and Zeng et al does not teach or suggest multiplying an integrated partial derivative of measuring values by the three weighting factors required by claim 1.

The Rejection of Claim 4 under 35 U.S.C. 103(a)

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Danielsson et al. in view of Katsevich and Zeng et al. This rejection should be withdrawn because the combination of Danielsson et al., Katsevich and Zeng et al. does not teach or suggest all the limitations of claim 4 and, therefore, does not establish a *prima facie* case of obvious with respect to claim 4. However, the combination of Danielsson et al., Katsevich and Zeng et al. does not teach or suggest such aspects.

Independent **claim 4** is directed towards a computed tomography, which includes, *inter alia*, a control unit configured to control the radiation source, the detector unit, the drive arrangement and the reconstruction unit in conformity with the steps of determining the partial derivative of measuring values, multiplying the integrated partial derivative of the measuring values by a second weighting factor which corresponds to the reciprocal value of the cosine of a fan angle of the beam associated with the measuring values. The combination of Turbell et al., Katsevich and Zeng et al. does not teach or suggest these claim aspects.

The Office concedes that Danielsson et al. fails to teach or suggest the subject claim aspects. Similar to the rejection of claim 1, the Office attempts to make up for these conceded deficiencies by asserting that Katsevich and Zeng et al. teaches the subject claim aspects and that it would have been obvious to one of ordinary skill in the relevant art to modify Danielsson et al. with the teachings of Katsevich and Zeng et al. As such, the discussion above regarding claim 1 applies *mutatis mutandis* to claim 4.

The Rejection of Claim 5 under 35 U.S.C. 103(a)

Claim 5 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich and Zeng et al. and further in view of Hsieh. **Claim 5** depends from claim 1 and is allowable at least by virtue of this dependency.

The Rejection of Claims 7-11 and 14 under 35 U.S.C. 103(a)

Claims 7-11 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich. **Claims 7-11** directly or indirectly depend from claim 6 and are allowable at least by virtue of their dependencies.

Claim 14 requires reconstructing the measuring values as a function of:

$$-\frac{1}{2\pi^2}\int_0^{\pi} d\varphi\; p(y(s(\varphi)),\Phi(s(\varphi),x))\,.$$

The Office asserts that Katsevich teaches this claim aspect in equation 12. However, the Office is mistaken. First, Equation 12 of Katsevich defines the cone beam transform term ($\Psi(s,\beta)$) of Equation 13, and Equation 13 ($-\frac{1}{2\pi^2}\int_{I\rho I(s)}\frac{1}{|x-y(s)|}\psi(s,\beta(s,x))ds$) is the function representing the distribution of the x-ray attenuation coefficient inside of an object being scanned. From the above, Equation 13 is a function of the integration variable s, whereas the Equation of claim 14 is a function of the projection angle φ. As disclosed in the instant specification, integrating over the integration variable s would require a large amount of calculation work, whereas the equation of claim 14 would require less calculation work. In one instance, this is because $\frac{1}{|x-y(s)|}$ is multiplied by each of the measuring values in order to reconstruct the spatial absorption distribution in the examination zone. Since Equation 13 does not teach or suggest claim 14, this rejection should be withdrawn.

The Rejection of Claims 12 under 35 U.S.C. 103(a)

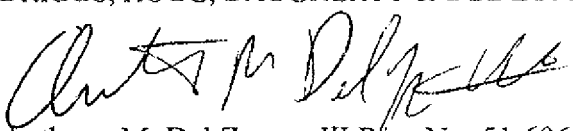
Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Turbell et al. in view of Katsevich and further in view Zeng et al. **Claim 12** indirectly depends directly from claim 6 and is allowable at least by virtue of this dependency.

Conclusion

In view of the foregoing, it is submitted that the claims distinguish patentably and non-obviously over the prior art of record. An early indication of allowability is earnestly solicited.

Respectfully submitted,

DRIGGS, HOGG, DAUGHERTY & DEL ZOPPO CO., L.P.A.



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